THE MORPHOMETRY AND GEOLOGY OF PLASTIC AND HENEY LAKES AND THEIR CATCHMENTS

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DATA REPORT SERIES

The data presented in this report were collected by staff of the Aquatic Ecosystems Sections of the Water Resources Branch of the Ministry of the Environment as part of the Lakeshore Capacity Study or the Acid Precipitation in Ontario Study. This unreviewed report does not necessarily reflect the views of opinions of the Ontario Ministry of the Environment.

THE MORPHOMETRY AND GEOLOGY OF PLASTIC AND HENEY LAKES AND THEIR CATCHMENTS

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DATA REPORT 85/1

PREFACE

The unpublished Data Report Series is intended as a readily available source of basic data collected for lakes and watersheds in the Muskoka-Haliburton area of Ontario. These data were collected as part of the Lakeshore Capacity Study and/or the Acid Precipitation in Ontario Study.

The limnological portion of the Lakeshore Capacity Study (1975 - 1981) was initiated to investigate the relationships between lakeshore development and lake trophic status in low ionic strength Precambrian lakes. The Acid Precipitation in Ontario Study (1979 - present) was initiated, in part, to investigate the effects of the deposition of strong acids on aquatic and terrestrial ecosystems in Ontario. The primary findings of these studies have been and will continue to be published as reviewed papers and technical reports.

ABSTRACT

Morphometric and geologic data are presented for Plastic Lake (Lat. 45°11' Long. 78°50') and Heney Lakes (Lat. 48°08' and Long. 79°06'), and their catchments.

Girard, R., R.A. Reid and W.R. Snyder. 1985. The Morphometry and Geology of Plastic and Heney Lakes and their catchments. Data Report 85/1.

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INTRODUCTION

This report summarizes the morphometric and geologic information collected for Plastic and Heney Lakes and their watersheds. The methodology used to prepare the maps and calculate morphometric parameters is outlined by Scheider et al. (1983). The lake outlines were taken from aerial photographs.

REFERENCES

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NICOLLS, A., R. Reid and B. Girard. 1983. Morphometry of the Muskoka-Haliburton Study Lakes. Ont. Ministry of the Environment. Data Report 83/3.

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PLASTIC LAKE

HALIBURTON Co.
SHERBORNE Tp.
Lat. 45° 11′ Long. 78° 50′

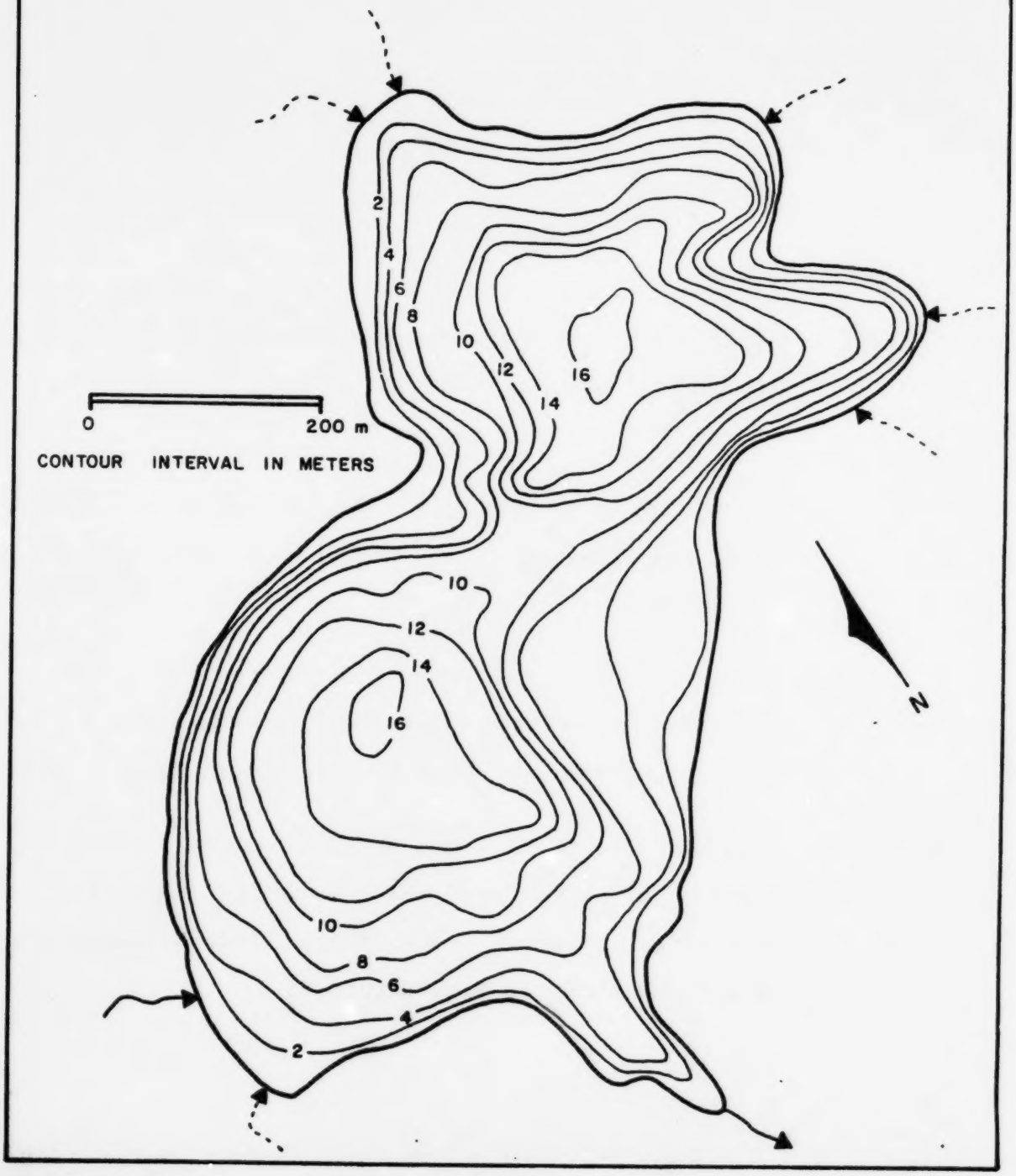

TABLE 1. PLASTIC LAKE MORPHOMETRY SUMMARY

Lake Area (ha)	Lake Volume V ($m^3 x 10^5$)	Mean Depth z (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
32.3	25.8	8.0	16.0	2.92	1.45	1.50

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 x 10^5$)
0	32.3	
		6.14
2	29.1	
		5.38
4	24.8	
		4.46
6	20.0	
		3.56
8	15.7	
		2.67
10	11.1	
		1.91
12	8.11	
		1.25
14	4.53	
		0.454
16	2.50	

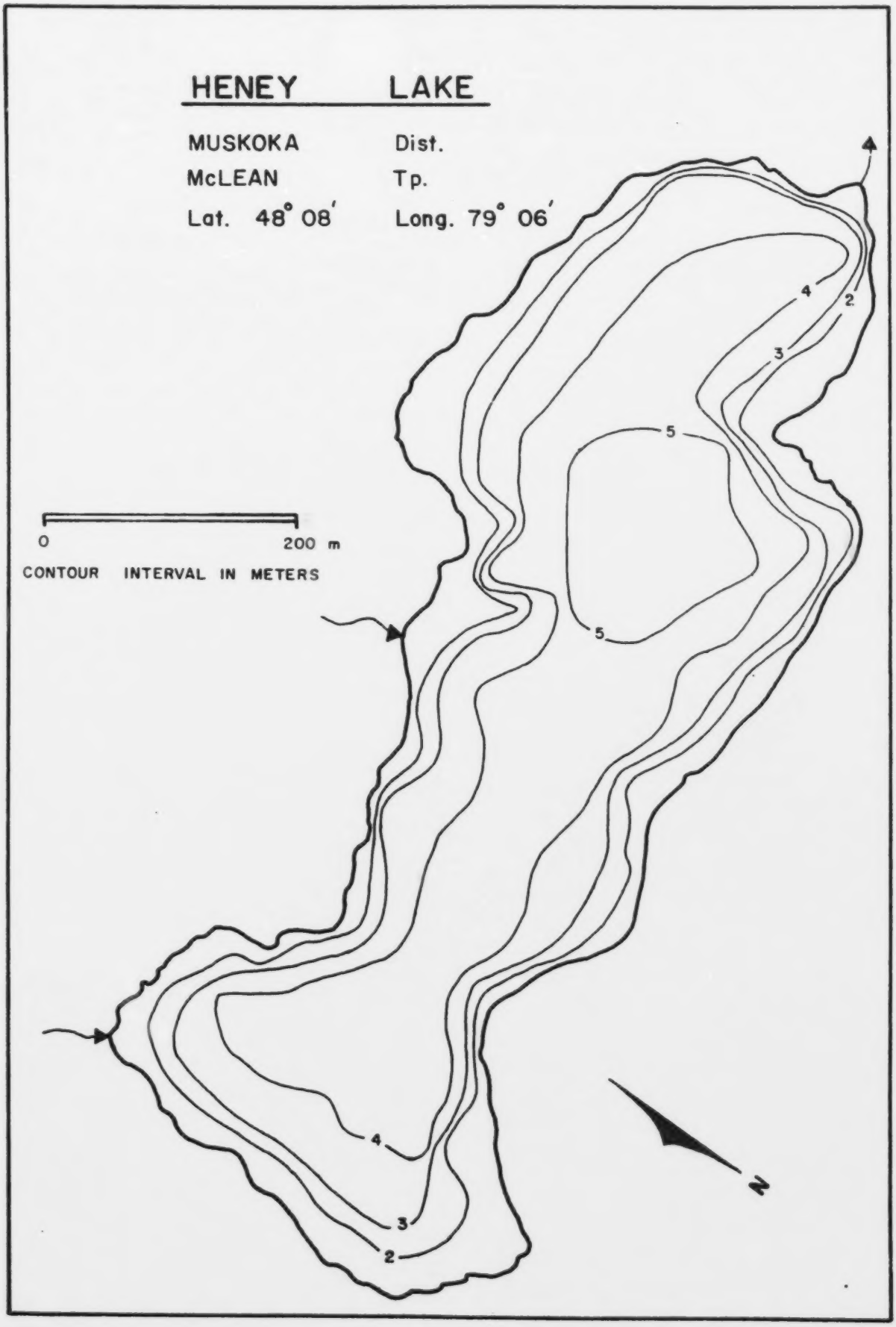
HENEY LAKE
MUSKOKA Dist.
McLEAN Tp.
Lat. 48° 08′ Long. 79° 06′
0 200 m
CONTOUR INTERVAL IN METERS
2
3
4
5
5
4
3
2
N

TABLE 2: HENEY LAKE MORPHOMETRY SUMMARY

Lake Area (ha)	Lake Volume V ($m^3 x 10^5$)	Mean Depth $\bar{z}$ (m)	Maximum Depth z_m (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
21.7	7.17	3.3	6.00	2.55	1.54	1.65

Contour Depth (m)	Contour Area (ha)	Stratum Volume ($m^3 x 10^5$)
0	21.7	3.88
2	17.1	2.74
4	8.93	0.555
6	0	

A. PLASTIC LAKE

(i) LOCATION

Plastic Lake (45°11' latitude, 78°50' longitude) is located in the Leslie M. Frost Natural Resources Centre forest in Sherborne Township, Haliburton County. The lake is reached by travelling east on a forest access road from Highway #35 south of Dorset. The forest access road enters the Plastic watershed from the south near the lake outflow, and transects the subwatershed on the west side of the lake, exiting in the north. The winter access to Plastic Lake is by snowmobile and there are no cottages or homes on the lake.

(ii) BRIEF DESCRIPTION

Plastic Lake is a small Precambrian Shield headwater lake. The watershed is also relatively small covered by a thin, discontinuous layer of basal till; exposed bedrock is common. The bedrock type is gneiss of igneous origin with some outcrops showing metasedimentary characteristics and a small meta-gabbro plug. Organic deposition is occurring in bog areas and weakly developed podzolic or brunisolic soils have developed on the thin basal tills. The forest is dominated by coniferous trees, with white pine and hemlock being common. Black spruce dominates the bog area while hardwoods (maple and birch) are common on the few slopes with slightly deeper basal till deposits.

(iii) DRAINAGE

Plastic Lake is a headwater lake with only one small open-water pond in its watershed. Plastic Lake flows south into St. Nora Lake, which empties through a series of lakes into the Gull River.

The Plastic Lake watershed rises steeply from the lake surface on all sides with no point in the watershed being greater than 1 km from the lake itself.

The lake is fed by one perennial stream and four dominant ephemeral streams. The streams exhibit angular drainage patterns as they follow the glacial modified bedrock valleys.

The subwatershed boundaries and stream channels for Plastic Lake are shown in Fig. 3.

(iv) BEDROCK

The Plastic Lake watershed bedrock is a hard, erosion- and weather-resistant gneiss, with a substantial igneous component. The ortho-gneiss bedrock shows classic igneous massive and unbedded characteristics in most outcrops. However, many outcrops show fine-scaled bedding typical of metamorphical sedimentary bedrock units. The metasedimentary outcrops may represent the original host units introduced by the igneous intrusive. The bedrock is highly resistant to glacial modification, with the resistant ortho-gneiss forming the higher polished ridges, while fault zones and beds with stronger metasedimentary characteristics tend to dominate the valleys. A small meta-gabbro plug appears on the east shoreline of Plastic Lake.

The bedrock geology of the Plastic Lake watershed is presented in Fig. 4.

(v) STRUCTURAL CONTROL

Plastic Lake appears to be the effect of glacial erosion in structurally-weakened bedrock at the intersection of several major bedrock faults. A series of north-east/south-west trending faults are dominant factors in defining the north and south shore of Plastic Lake. A strong north-east to south-west trending fault runs along the western shore of Plastic Lake, while a north-south trending fault occurs near the west shore although glacial scouring has scooped out the west basin beyond this projected fault line. It should be noted that the north-east/south-west trending gneissosity and the varying degrees of bedrock hardness may also have effected present morphological conditions of the Plastic Lake watershed.

Lineaments of the Plastic Lake watershed are shown in Fig. 5.

(vi) SURFICIAL GEOLOGY

The surficial cover of Plastic Lake watershed is dominated by a shallow, discontinuous, sandy basal till containing angular to subangular boulders. Generally the south slopes have somewhat thicker till cover, while steep bedrock zones and north-east trending ridges tend to have more exposed bedrock. The bedrock configuration is generally minimized by the shallow veneer of surficial material. The areas of organic accumulation tend to be depressions in the bedrock which are water-saturated much of the year due to bedrock hindrance of water movement towards the lake. The Sphagnum-coniferous bogs are usually without open water.

The thin soils of the Plastic Lake watershed range between weakly-developed podzols and poorly-developed brunisols. The thin, sandy surficial cover has resulted in a pit-mound terrain as mature trees topple, uprooting the soil, often leaving a pit bottom of bedrock. This continuous disruption of the soil hinders the development of a continous grey leached soil horizon, indicative of podzolic soils. The pit and mound soil disturbance is compounded by the steep slopes associated with Plastic Lake which accelerate soil migration and tree uprooting.

The surficial geology of Plastic Lake is shown in Fig. 6. Table 3 provides the areal extent of the surficial deposit types.

(vii) INDIVIDUAL WATERSHED DESCRIPTIONS

The Plastic #1 subwatershed drains the north-westerns section of the watershed. The surficial cover is generally shallow (<2 m) with ortho-gneiss bedrock being exposed on the high ridges and lineament faces. A single, large Sphagnum-conifer bog occupies the south-central portion of the watershed. This bog is fed by two main tributaries, one entering from the north-west and the other from the north-east. The north-western tributary drains a large bedrock outcrop which forms the north-west boundary of the watershed. This stream tributary first appears at the southern extremity of a small bog and flows through a thin till region along a south-west trending lineament. The stream tributary then veers 90 degrees to the south-east and enters the subwatershed's major bog. The north-eastern tributary drains a small south trending valley and a wetland area before striking south-west in a narrow bedrock controlled valley to the main bog. A small stream forms in the relatively flat, poorly drained area to the east of the Plastic Lake access road, and passes west through a culvert in the road and down a steep incline to the main bog. These upland headwater tributaries show little streambed development and seldom cut through the shallow till to bedrock. The main bog lies in a bedrock depression and collects

drainage from nearly all the Plastic #1 subwatershed. The bog outflows at the southern end of the bog cut through the shallow till to expose about a 1 m wide bedrock-based channel. The overburden is extremely thin throughout the subwatershed with exception of the bog areas and an area of moderately thin till to the north-west of the main bog. Bedrock outcrops are common in the thin till and several large elongated outcrops occur thoughout the subwatershed.

Plastic #2 subwatershed drains a narrow valley which rises steeply northward from the lake then hooks directly west and levels out. The upper section of the watershed has moderately thin till, while in the lower section the till and rock ridges dominate.

Plastic #5 subwatershed drains an open water pond which has been enlarged by beaver activity. There are many rock ridges and severable sizeable bedrock outcrops throughout the area of thin till. A small area of slightly deeper till runs at the extreme north of the watershed. Plastic #5 subwatershed is dominated by a central bog, surrounded by extremely thin till and rugged rock ridges. The central valley, which hosts the bog, rises gently to the east and somewhat more steeply in the west flank. A small area of moderately thin till is located in the extreme west of the subwatershed.

Plastic #6 subwatershed, similar to Plastic #5, is a broad, gently sloping valley with a centrally-located bog. The overburden consists of rock ridges and thin till with a ribbon of moderately deep till on the rear eastern boundary.

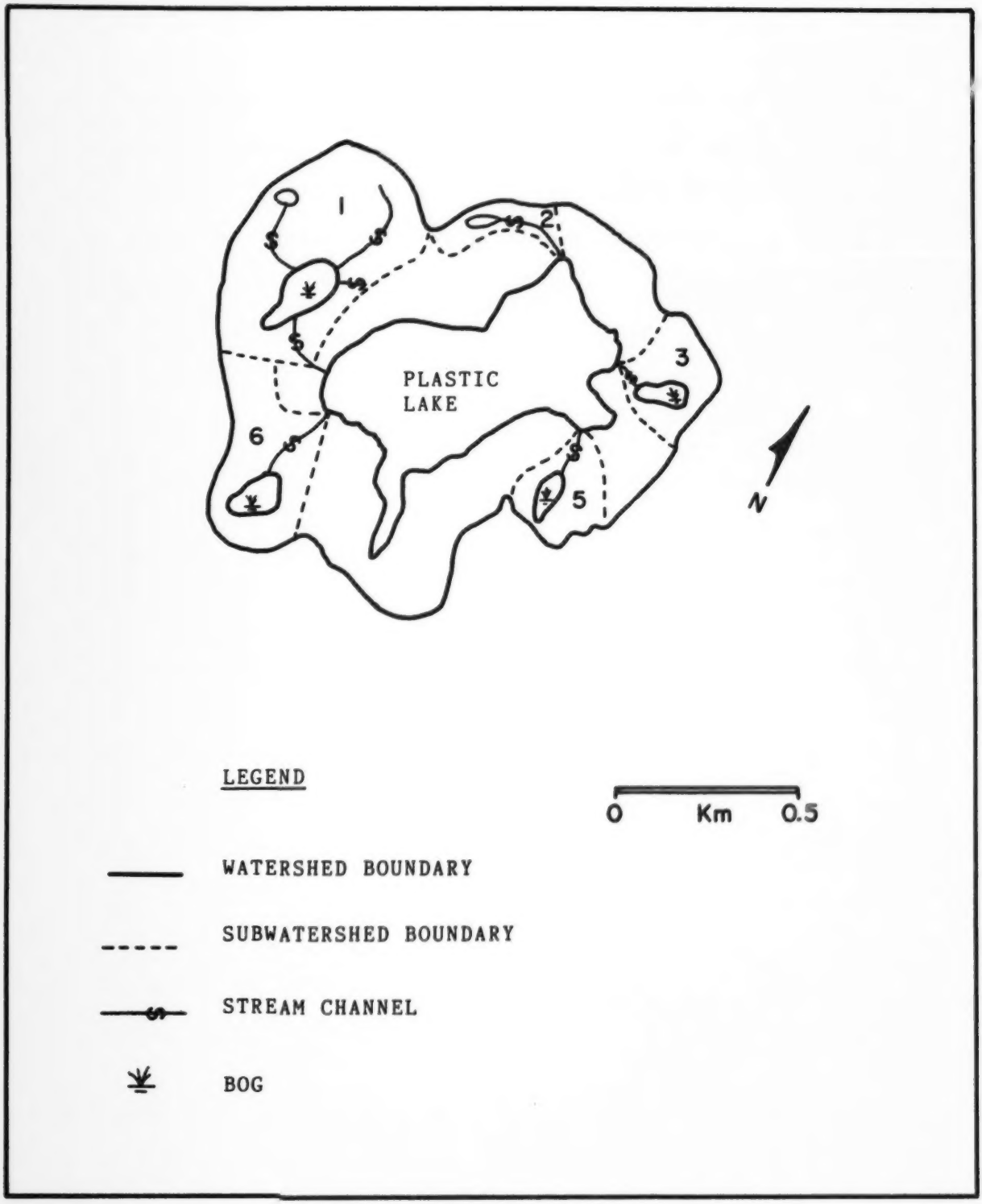

FIGURE 3 - BASIN DESIGNATION OF THE PLASTIC LAKE WATERSHED

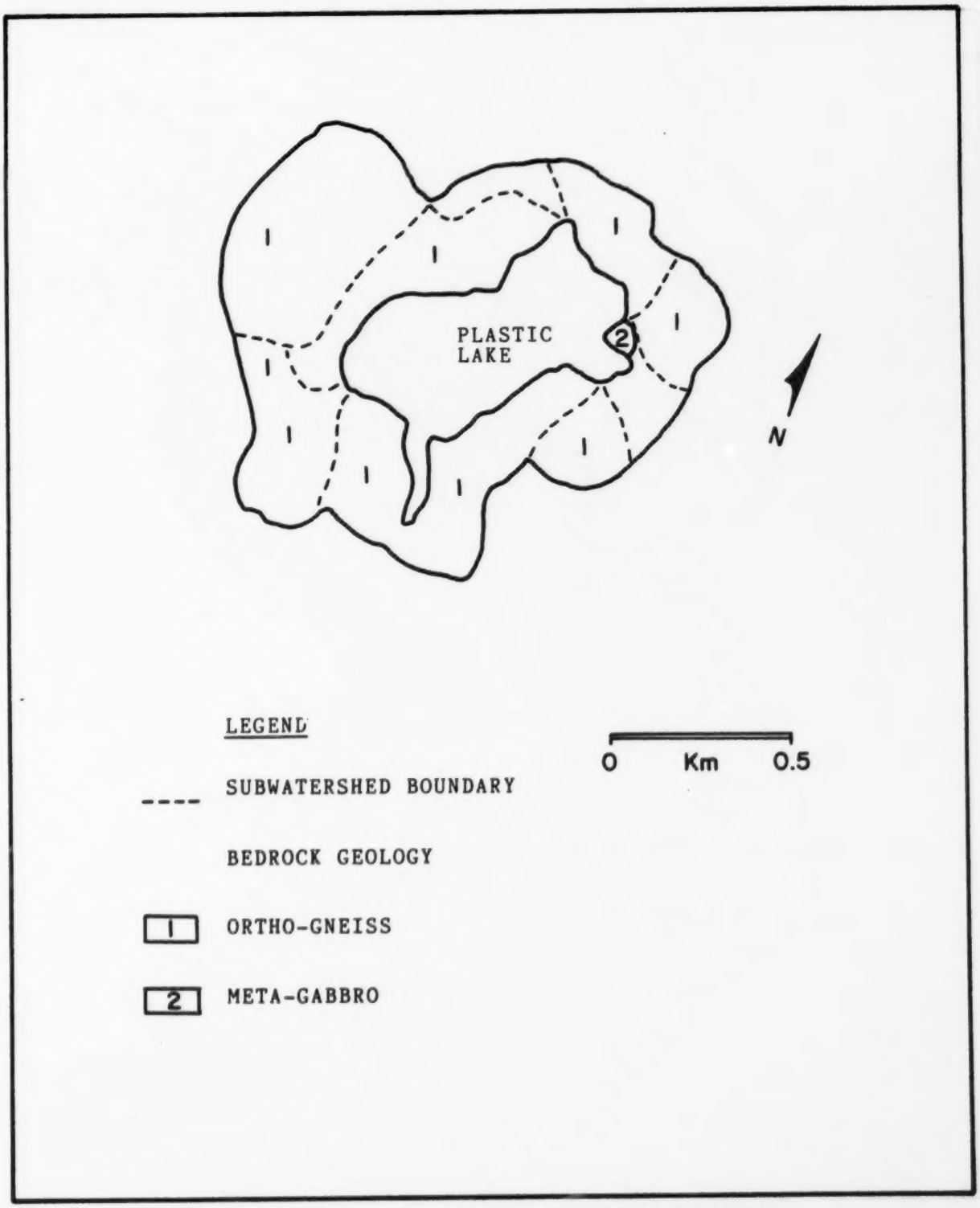

FIGURE 4 - BEDROCK GEOLOGY OF THE PLASTIC LAKE WATERSHED

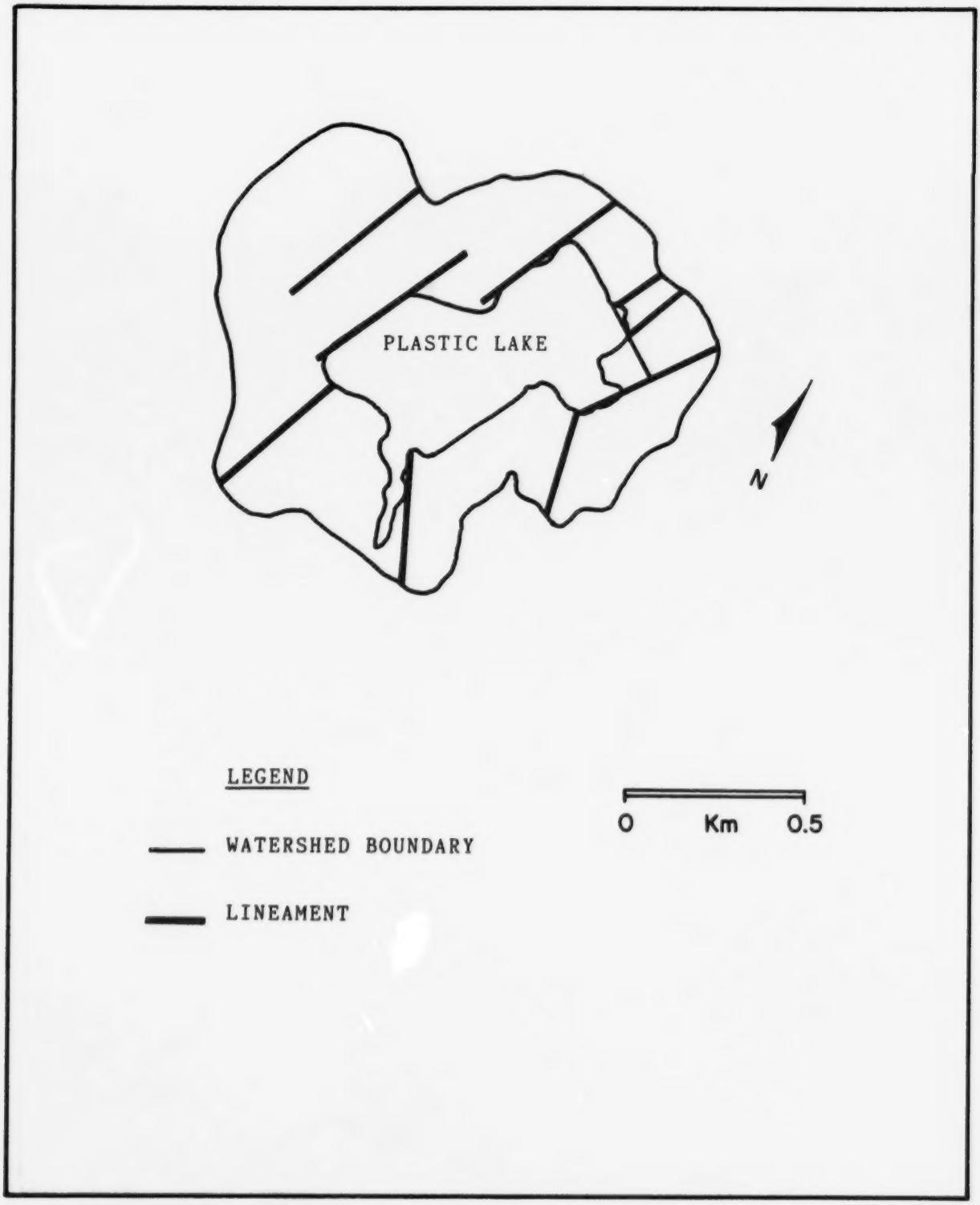

FIGURE 5 - LINEAMENTS OF THE PLASTIC LAKE WATERSHED

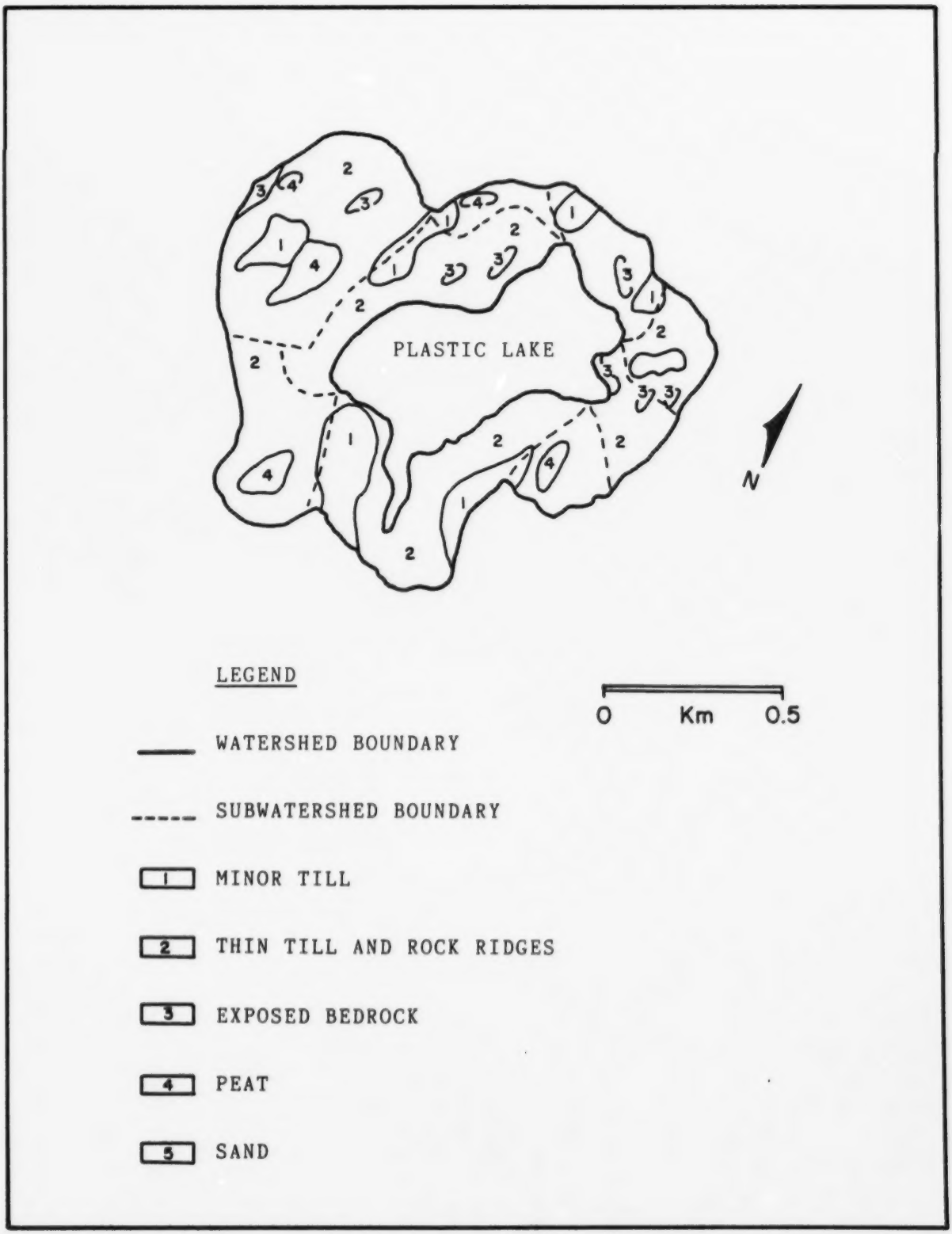

FIGURE 6 - SURFICIAL GEOLOGY OF PLASTIC LAKE WATERSHED

TABLE 3: Surficial deposit types of Plastic watersheds and subwatersheds.

Lake basin	Till Carbonate	Minor Till Plain	Thin Till and Rock Ridges	Peat Sand	Peat Till	Bedrock	Outwash	Silt	Diamict	Sand	Pond
Plastic #1	-	9.6	80.2	-	7.0	3.2	-	-	-	-	-
Plastic #2	-	16.3	78.1	-	5.6	-	-	-	-	-	-
Plastic #3	-	1.4	78.2	-	-	8.5	-	-	-	-	11.9
Plastic #5	-	5.2	83.8	-	11.0	-	-	-	-	-	-
Plastic #6	-	36.7	46.8	-	12.5	2.1	-	-	-	-	-
Misc.	-	17.1	80.8	-	-	-	-	-	-	-	-
Total	-	11.8	73.8	-	-	-	-	-	-	-	-

B. HENEY LAKE

(i) LOCATION

Heney Lake is located 45°08' latitude and 79°06' longitude. The lake is located in McLean Township, Muskoka District, 3 kilometers south of Baysville on the Heney Lake Road. The Heney Lake Road is open year-round to access the few permanent residences and cottages.

(ii) BRIEF DESCRIPTION

Heney Lake is a small headwater, Precambrian Shield Lake. The watershed is small and is covered by a thin, discontinuous layer of basal till which has been modified by the presence of the glacial lake. The bedrock type is migmatite, a combination of felsic igneous intrusive and metasedimentary gneiss characteristics. Organic deposition is occurring in watershed bog areas and soils are weakly developed podzolic and brunisolic in nature. The bog areas are dominated by spruce or alders, while conifers dominate the remainder of the watershed. Hardwoods are found in the upland area having slightly deeper overburden.

(iii) DRAINAGE

Heney Lake is a headwater lake with no open water found within the watershed. Heney Lake's easterly outflow combines with the Dickie Lake outflow and joins the South Muskoka River to the south-east. The South Muskoka River empties into Lake Muskoka and ultimately into Lake Huron/Georgian Bay. The Heney Lake watershed has no significant stream basin on the south, east and west boundaries of the lake.

The bedrock drainage control is impressively illustrated by the steep, narrow bedrock ridge at the east end of Heney Lake which separates Heney Lake from the South Muskoka River several hundred feet below to the west. The lake is fed by two perennial streams which flow through low-gradient valleys with moderately sloping sides from the north. Both streams exhibit angular drainage as they follow glacial-scoured bedrock valleys. Both subwatersheds have large reed-covered bogs near the stream mouth, which flood each spring.

The subwatershed boundaries and stream channels for Heney Lake are given in Fig. 7.

(iv) BEDROCK

Heney Lake bedrock has been mapped as undifferentiated migmatites. The bedrock is a contorted mass of felsic intrusive and remnant zones showing host meta-sedimentary gneiss characteristics. Zones of mafic enrichment are common. The bedrock is highly resistant to both physical and chemical weathering, although glacial scouring has created a relatively broad valley which host the two Heney Lake streams.

The bedrock geology of Heney Lake is presented in Fig. 8.

(v) STRUCTURAL CONTROL

The existence and shape of Heney Lake would appear to be a result of a set of faults striking north-east to south, intersecting a set of faults striking almost east-west. The north-east trending lineaments which mimic the Heney #1 and #2 stream channel also parallel the regional fault which is occupied by the Muskoka River to the west and the Dickie Lake outflow to the east. The east/west trending faults which form the north-south shore of Heney are not strongly represented regionally but are evidenced by sections of a straight shoreline. The impact of gneissosity and varying bedrock hardness has also probably had an influence on lake and watershed shape.

A lineament map of Heney Lake watershed is given in Fig. 9.

(vi) SURFICIAL GEOLOGY

The Heney Lake watershed is dominated by a thin veneer of sandy till. The thin till and rock ridges dominate the watershed with slightly deeper till deposits occurring in the elevated, gently sloping areas. The lower regions of the watershed have been overlain by the glacial Lake Algonquin, which apparently has removed much of the fine material from the thin basal till. The silt and fine sand now underlay the peat bogs adjacent to the lake. They are surrounded by extensive areas of very thin surficial cover.

The Heney Lake soils vary from weakly-developed podzols to weakly-developed brunisols.

The surficial geology of Heney Lake is given in Fig. 10. Table 4 presents the areal extent of the surficial deposit types.

(vii) INDIVIDUAL WATERSHED DESCRIPTION

Heney Lake subwatershed #1 drains a series of three bogs before entering Heney Lake midway along the north shoreline. The stream gradient is relatively low, with the valley rising gently on the eastern flank and somewhat more steeply on the western flank. The bog which adjoins the lake hosts Typha, with alders along the edge, while the two smaller bogs host Sphagnum and conifers. The majority of the basin is covered with extremely thin till and rock ridges, while in the north and western watershed boundary areas the till is deeper and more continuous. The lake-adjacent bog flooded under spring conditions preventing true encroachment.

Heney Lake subwatershed #2 is an oval-shaped basin with a large central bog which drains into the north tip of Heney's most north-westerly basin. The central Sphagnum/spruce bog gives way to alder near the lake. The bog is surrounded by thin till and rock ridges with somewhat deeper overburden area in the near subwatershed boundary areas.

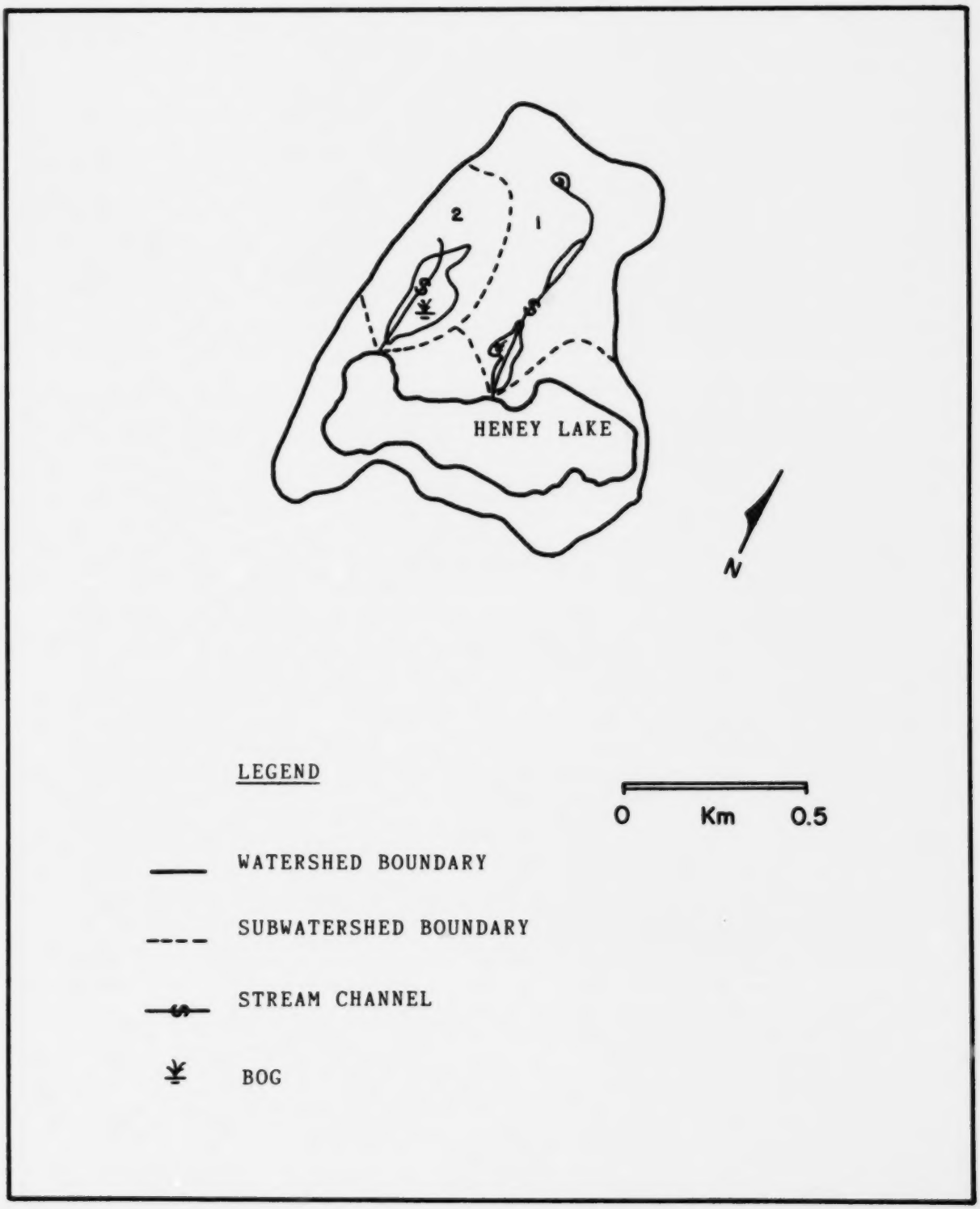

FIGURE 7 - BASIN DESIGNATION OF THE HENEY LAKE WATERSHED

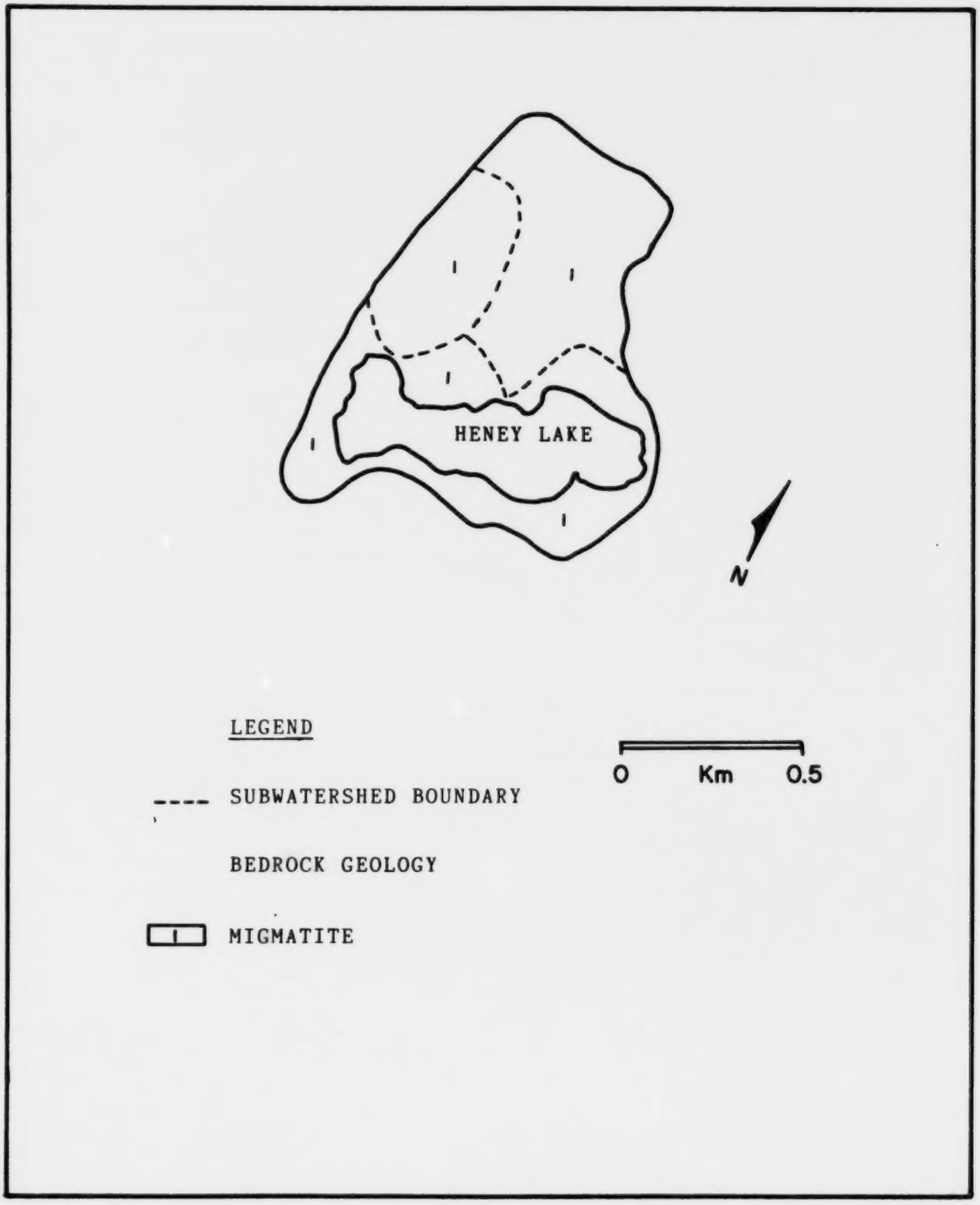

FIGURE 8 - BEDROCK GEOLOGY OF THE HENEY LAKE WATERSHED

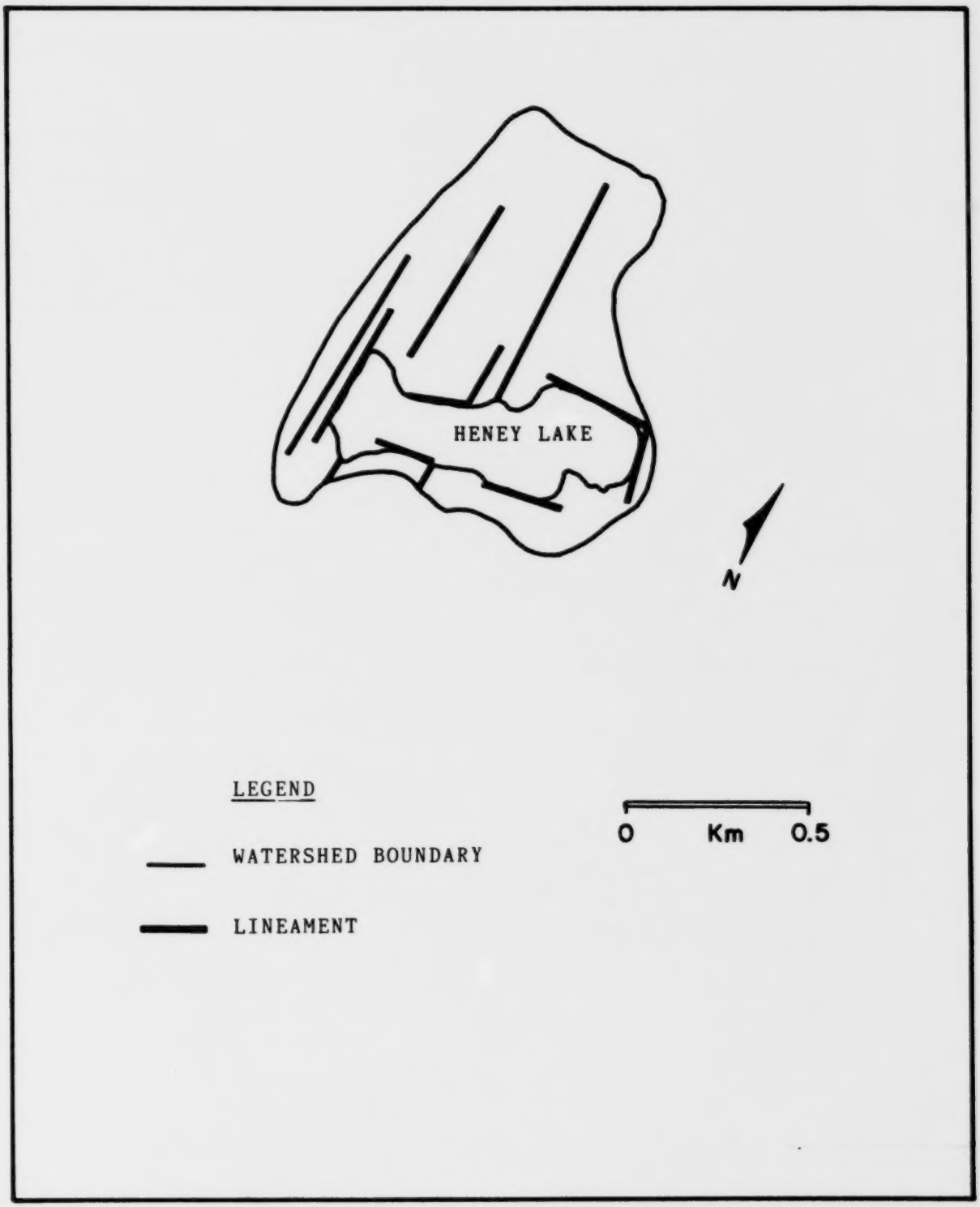

FIGURE 9 - LINEAMENTS OF THE HENEY LAKE WATERSHED

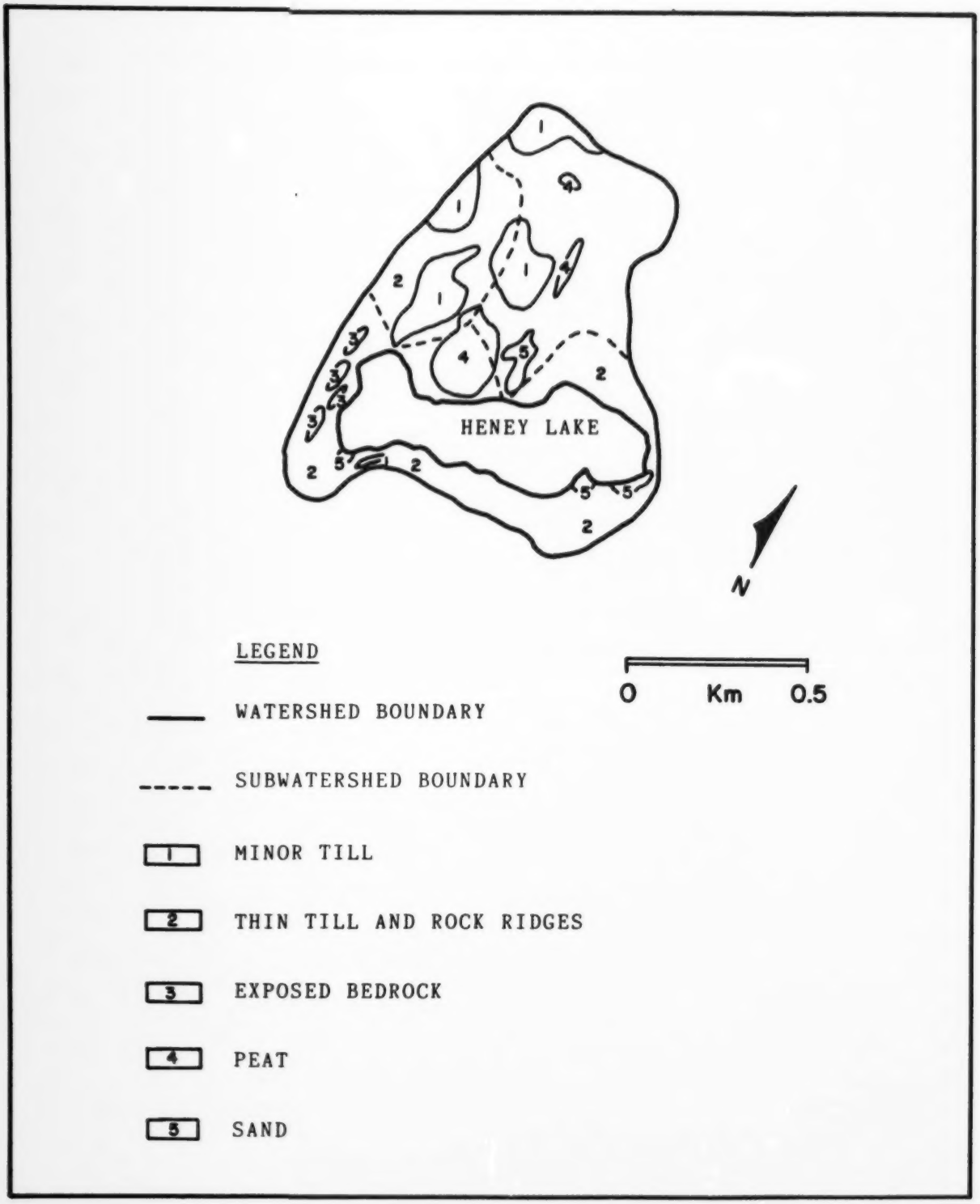

FIGURE 10 - SURFICIAL GEOLOGY OF THE HENEY LAKE WATERSHED

TABLE 4. Surficial deposit types of Heney Lake watershed and subwatersheds.

Lake Basin	Till Carbonate	Minor Till Plain	Thin Till and Rock Ridges	Peat Sand	Peat Till	Bedrock	Outwash	Esker	Drumlin	Sand	Pond
Heney #1	-	16.3	80.0	-	2.1	-	-	-	-	1.6	-
Heney #2	-	19.4	62.7	-	17.9	-	-	-	-	-	-
Misc.	-	8.8	88.1	-	-	.9	-	-	-	2.2	-
Total	-	14.0	80.4	-	3.6	.4	-	-	-	1.6	-